

Unclass

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Final report on grant to S.W.Fox at SIU, Carbondale.

History of grant, titled Informed Thermal Proteins at SIU

This grant was a residue of \$9000? from a \$180,000? grant to the same PI at the University of Miami; the transferred extension has been fruitfully used for integration of earlier reports and for initial new efforts in research on the origins of life and mind.

Overall advances

The principal advance during the period 1990-August 1993 at Southern Illinois University was largely that of spreading recognition of the fact that this program had provided a unique solution to the problem of the origins of life. The progress toward this goal has been noted in many textbooks since 1963, each of which has been typically 3-6 years behind the latest published evidence.

The essence of the solution resulted from the scientifically heretical findings that (1) amino acids heated hypohydrously order themselves with high selectivity into thermal proteins with no help from DNA/RNA, (2) the thermal proteins efficiently organize themselves, when wetted with water, into protocells, and (3) the protocells meet the definition of life in Webster's International Unabridged Dictionary by having the characteristics listed therein: metabolism, growth, reproduction, and response to stimuli in the environment. In addition, the protocells (proteinoid microspheres) are constituted from thermal proteins informed by their precursor amino acids instead of by their sequels, the nucleic acids. The latter have been widely and deeply assumed, as has widely been assumed by others, a relationship that is indeed true for modern cellular systems.

During the report period, an analysis of the inhibiting preconceptions has been published by Fox and Pappelis in Quarterly Review of Biology (1993) by request. (Pappelis is a biology teacher who has been privy to the newest information and has found that he can successfully teach an integrated cosmic story of life's origins to students in the context of the new understanding).

The newer consequences based on the highly precise nonrandom self-ordering of amino acids are presented in the October 1991 NASA brochure on Earth Benefits from NASA Research and Technology. These benefits include terrestrial waste and pollution control (p.30) and advances in neurobiology and neuromedicine such as antiaging, synthetic nerve growth factors, nerve repair, and memory enhancement (p.18). Missing from this recital is the leading application of thermal proteins to improved drug delivery of heparin, vaccines, insulin, etc., as detailed in the annual report of Emisphere.

Some references that recognize the new views, including the synthesis of life in the laboratory, are:

A. Kornberg: For the Love of Enzymes (1989) on the primacy of proteins. Famous for his enzymic synthesis of polynucleotides, Nobelist Kornberg attributes the essence of life to proteins, characterizing nucleic acids as "instruction manuals" and emphasizing that few biochemists understand this relationship. Recounting his experiences with reporters, Kornberg also debunks the popular idea that synthesizing DNA or RNA is in any way a synthesis of life.

A. Grobman: This primary initial director of the Biological Sciences Curriculum Study (1963 on) has stated on the cover of Fox' 1988 The Emergence of Life (Basic Books) that a protocell has been synthesized.

S. Mader: Biology, third edition, has listed a selection of living properties in proteinoid microspheres. These include all of those that are listed under the definition of life in Webster's International Unabridged Dictionary.

Who's Who in America. The 1992-1993 edition lists S.W. Fox as the "first" to synthesize a protoorganism in the laboratory. Evidently, they inferred this from a 1991 (Fox) publication on the synthesis of life in the lab. The 1994 edition lists Fox also as the pioneer in amino acid sequence determinations. The unstated significance of this is that intimate knowledge of how to determine terminal amino acid compositions led our laboratory in the hands of Kaoru Harada, to observe early that thermal proteins are highly ordered, at a time when others were still skeptical that amino acids could be polymerized by heat, let alone condense with self-ordering of the amino acids.

Recapitulation of Funding Experiences

The above report on successful synthesis of life in the lab leading into the procedurally closely related innovations in biomedical science and environmental water treatment, are discussed as consequences of basic research in the NASA Earth Science Applications brochure of October 1991. The basic research began with the stewardship and central funding support of NASA through Dr. Richard S. Young, then at the Ames Research Center. Dr. Young (a) repeated and extended to low temperatures the then new (1960) finding of thermal polycondensations of amino acids into thermal proteins (TPs) and (b) repeated and extended the finding of self-organization of thermal proteins to cells, by showing that fibers (chains of microspheres) could also result.

The putative cells were shown to have the properties of life in phase (c) lasting from 1960 through 1981. NASA funding, which was generous for 30+ years is predominantly responsible for phase (c). Phase (d) of research was for much new investigation into evolution beyond the protocells: this phase especially included (e) the origins of a primitive brain (Fox, 1992).

In 1989 Dr. John Yopp invited the PI to speak at a symposium in Austria and then invited him to test a visiting professorship at SIU, which was replaced by an appointment elsewhere in August 1993. In this period Dr. Yopp demonstrated his commitment to NASA and to origins science by identifying for the PI and SIU colleague Douglas Smith, associate professor of biopsychology, the NSF-SEGR grants of which one was awarded to Smith and Fox. It focuses on studies of amino acid composition vs electrical responses to light of TP microspheres and related problems.

The work has become predominantly collaborative and has branched into three main lines:

- (a) Examination of new evidence that the protocell was also a protoneuron (Fox, 1992; Yu, Bi et al, 1993). Study with Dr. Douglas Smith of amino acid compositions. e.g. tyr %, for their effects on strength and frequency of electrical response to light by the synthetic neurons. This continues interinstitutionally. The effect of included lecithin is also being investigated.
- (b) With Dr. Aristotel Pappelis, discovery of network morphology of TP microspheres already shown again to be dependent upon tyr %, and which give dendritic polymers when precipitated from solution. This study needs further work, especially the nature of electrical signals varying with the morphology.
- (c) With working visitor from China, Dr. Bi Yu, the finding that % of lecithin in the TP vesicles controls duration and amplitude of electrical signals.

The above studies have been proceeding under the title Informed Thermal Proteins with a relatively small residue of <\$10,000 transferred to SIU from U Miami, and with the contributed effort of Dr. Yu who could not legally accept salary knowingly until he received lawful permanent residence (recently awarded July 1993). Contributing to the work has been a 2nd year medical student, David Good, who brought his summertime NIH grant from the University of Alabama in Birmingham. PI Fox also has contributed personal funds of slightly <\$15,000 for legal fees and maintenance of Dr. Yu and for other purposes.

After a 4-months trial period at U So Alabama where pollution studies (see NASA brochure) in the Mineralization Center use TPs and where there exists a very complete chemistry lab employing procedures pioneered by the PI, Fox has accepted and operates under an appointment in the Coastal Research and Development Institute of USA.

For one of the more recent proposals from U Miami to NASA anonymous reviewers stated that PI Fox should retire to writing books etc. This seemed to this report writer to be advice from panel reviewers whose folks probably have longevity in the age group of 60s-70s delivered to one (Fox) whose family longevity is in the 90s-100s.

Of relevance to funding is the fact that, upon arriving at USA in August, Fox found waiting for him a note from the USA Office of Sponsored Programs a U.S. Program Announcement PA-93-068, The Human Brain Project. This announcement is composed of 10 research agencies in the U.S.; it was released April 1993. On checking, it was learned that neither Fox nor Smith had been informed of this announcement, for which filing date was June 15, 1993.

Patents

1. New potentially patentable material produced during the stay at SIU concerns a new form of synthetic microencapsulation for drug delivery. This was done with Michael O'Keefe who states he regards 10% of the inventors' (noninstitutional) rights as a fair portion.

2. Potentially valuable material for synthetic neural networks, useful perhaps in computer construction. This was done with Professor Aristotel Pappelis. We have an understanding that the noninstitutional portion of the rights will be 50-50.

REFERENCES

Due to the fact that this report is prepared during moving between institutions and prior to unpacking of about 300 cartons of records, these references may be somewhat incomplete. They are presented as fully as possible for this report.

References especially relevant to this report

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Several abstracts to be disinterred from cartons used in
moving. Especially one at a meeting in St. Louis in which is
explained the chemical basis for the evolution of
biodiversity.